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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/428,052 10/27/99 IRINO

K 970901A

EXAMINER

023850 MM91/0809
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WASHINGTON DC 20006

DIAZ, J

ART UNIT

PAPER NUMBER

2815

DATE MAILED:

08/09/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.		Applicant(s)	
	09/428,052		IRINO, KIYOSHI	
	Examiner		Art Unit	
	José R. Díaz		2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 May 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 6, 10-13, 15 and 16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15 and 16 is/are allowed.
- 6) ☒ Claim(s) 6 and 10-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

➤ The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

➤ Claims 10-12 rejected under 35 U.S.C. 102(e) as being anticipated by Arai et al. (US Patent No. ^{5, 927, 783} 972,783) ^{1/29/02}.

Regarding claim 10, Arai et al. teach a method of fabricating a semiconductor device (see columns 1-32) comprising the steps of: forming a gate oxide film (2) on a substrate (1); forming a gate electrode pattern (3) on said gate oxide film (2); and introducing N atoms into said gate oxide film (2) while using said gate electrode pattern (3) as a mask, wherein said step of introducing N atoms into said gate oxide film includes an ion implantation process of N ions; and applying a thermal annealing process to said gate oxide film (column 12, lines 37-39, 44-49 and 55-56).

Regarding claim 11, Arai et al. teach an acceleration voltage of about 10 keV (column 12, lines 69).

Regarding claim 12, Arai et al. teach a dose of about $1-3 \times 10^{14} \text{ cm}^{-2}$ (column 12, lines 61-62).

Claim Rejections - 35 USC § 103

➤ The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

➤ Claim 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (US Patent No. 5,808,348) in view of Maiti et al. ("Oxynitride gate dielectric grown in nitric oxide (NO): the effect of reoxidation on dielectric reliability of the active edge", IEEE Electron Device Letters, Volume: 17 Issue: 6, June 1996 Page(s): 279 -281).

Regarding claim 6, Ito et al. teach a method of fabricating a semiconductor device (see col. 1-6) comprising the steps of: forming a gate oxide film (12) on a substrate (10); forming a gate electrode pattern (20) on said gate oxide film (12); introducing N atoms into said gate oxide film (12) while using said gate electrode pattern (20) as a mask (column 3, lines 25-27, 30-35, and 40-43), wherein said step of introducing N atoms into said gate oxide film comprises a thermal annealing process of said gate oxide film conducted in an atmosphere containing N atoms and O atoms (column 5, lines 65-66). However, Ito et al. fail to teach the steps of annealing said gate oxide film in an atmosphere containing NO at about 800 °C. Maiti et al. teach that it is well known in the art to anneal in a NO ambient at 850 °C to reduces local build-up of positive charge near the gate electrode (See Section II: Experimental). Therefore, it would have been obvious to one having ordinary skill in the art at the same time the

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invention was made to modify Ito et al. to include the step of annealing in a NO ambient at 850 °C. The ordinary artisan would have been motivated to modify Ito et al. in the manner described above for at least the purpose of reducing local build-up of positive charge near the gate electrode.

Regarding claim 13, Ito et al. teach forming diffusion regions (28, 30) at both lateral sides of said gate electrode pattern (20) by introducing impurity elements into said substrate (10) through said gate oxide film (12) while using said gate electrode pattern (20) as a mask, and wherein said step of introducing impurity elements is conducted prior to said step of introducing N atoms into said gate oxide film (12) (column 4, lines 34-39 and 47-48).

Allowable Subject Matter

- Claims 15-16 are allowed.

Response to Amendment

- Applicant's arguments filed May 24, 2001 have been fully considered but they are not persuasive. Applicant's argument about the "NO" is not persuasive since is inconsistent with the statement on page 12, lines 1-3 of the Specification, wherein Applicant states that: "it should be noted that the exposure process may be conducted in an atmosphere containing N₂O in place of NO." Moreover, with regards to the limitation that "the ion implantation of the impurity element such as As⁺ is conducted immediately after the ion implantation process of N", the Examiner would not consider

the limitation since Applicant fails to claim it. Therefore, Applicant's arguments are not persuasive.

Conclusion

➤ **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

➤ The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ono (US Patent No. 5,966,606) discloses a sidewall film formed through nitridation of the gate electrode. Kraft et al. (US Patent No. 6,136,654) disclose method of forming thin silicon nitride. Gardner et al. (US Patent No. 6,110,784) disclose method of integration of nitrogen bearing high film.

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Correspondenc

Any inquiry concerning this communication or earlier communications from the examiner should be directed to José R. Díaz whose telephone number is (703) 308-6078. The examiner can normally be reached on 8:00 - 5:00 Monday through Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

JRD
August 6, 2001



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800